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# OPERABLE UNIT 4 RESPONSES TO COMMENTS ON THE DRAFT FINAL EVALUATION OF SILO 3 ALTERNATIVES REPORT

04/04/97

DOE-0780-97
DOE-FEMP EPAS
36
RESPONSES

**Department of Energy**

**Ohio Field Office**
**Fernald Area Office**
P. O. Box 538705
Cincinnati, Ohio 45253-8705
(513) 648-3155

APR 4 1997

DOE-0780-97

Mr. James A. Saric, Remedial Project Director
U.S. Environmental Protection Agency
Region V-SRF-5J
77 West Jackson Boulevard
Chicago, Illinois 60604-3590

Mr. Tom Schneider, Project Manager
Ohio Environmental Protection Agency
401 East 5th Street
Dayton, Ohio 45402-2911

Dear Mr. Saric and Mr. Schneider:

OPERABLE UNIT 4 RESPONSES TO COMMENTS ON THE DRAFT FINAL EVALUATION OF SILO 3 ALTERNATIVES REPORT

Please find enclosed responses to your respective comments on the Draft Final Evaluation of Silo 3 Alternatives Report, December 1996. The objective of the referenced document was to support and facilitate initial discussions with the agencies and our stakeholders concerning the appropriateness and viability of using alternative treatment technology for the Silo 3 wastes. With submittal of the enclosed comment responses, the Department of Energy (DOE) considers this objective met.

The DOE recognizes that the justification for pursuing alternative treatment of the Silo 3 wastes must be fully supported within the decision documents modifying the existing Operable Unit 4 (OU4) Record of Decision (ROD). The Draft Final Evaluation of the Silo 3 Alternative Report will not be referenced directly in an Explanation of Significant Difference or ROD amendment. As such, and consistent with discussions in our March 24, 1997, meeting, DOE is neither planning nor anticipating any further action by any party related to the subject document.

If you have any questions, please contact Nina Akgündüz at (513) 648-3110, or me at (513) 648-3139.

Sincerely,

Johnny Reising

Johnny W. Reising
Fernald Remedial Action
Project Manager

FEMP:Akgunduz

Enclosure: As Stated

cc w/enc:

N. Hallein, EM-42/CLOV
G. Jablonowski, USEPA-V, 5HRE-8J
R. Beaumier, TPSS/DERR, OEPA-Columbus
T. Schneider, OEPA-Dayton (total of 3 copies of enc.)
F. Bell, ATSDR
D. S. Ward, GeoTrans
R. Vandegrift, ODOH
R. Geiger, PRC
T. Hagen, FDF/65-2
J. Harmon, FDF/90
R. Heck, FDF/52-5
AR Coordinator/78

cc w/o enc:

C. Little, FDF/2
EDC, FDF/52-8

RESPONSE TO U.S. EPA TECHNICAL REVIEW COMMENTS ON
"DRAFT FINAL EVALUATION OF SILO 3 ALTERNATIVES"
VOLUMES 1 AND 2
FERNALD ENVIRONMENTAL MANAGEMENT PROJECT
FERNALD, OHIO
APRIL 2, 1997

# RESPONSE TO U.S. EPA TECHNICAL REVIEW COMMENTS ON "DRAFT FINAL EVALUATION OF SILO 3 ALTERNATIVES" VOLUMES 1 AND 2 FERNALD ENVIRONMENTAL MANAGEMENT PROJECT FERNALD, OHIO

## General Comments

Commenting Organization: U.S. EPA Commentor: Saric
Section #: Not Applicable (NA) Page #: NA Line #: NA
Original General Comment #: 1

Comment: Both Volumes 1 and 2, but especially Volume 1, contain numerous typographical and grammatical errors that detract from the clarity of the information presented. Both volumes should be carefully reviewed and edited to correct these errors.

Response: The comment on typographical and grammatical errors in the document is noted. A technical edit will be performed on future documentation to identify and correct typographical and grammatical errors and to ensure that all documents are consistent.

Commenting Organization: U.S. EPA Commentor: Saric
Section #: NA Page #: NA Line #: NA
Original General Comment #: 2

Comment: Vitrification treatability testing of residues from Silo 1, 2, and/or 3 should address the presence of nitrates and urea in the feed to the melter, especially if ammonia is also present in the feed. Ammonia reacts with nitrogen oxides to form ammonium nitrate, an explosive. Ammonium nitrate could build up in the off-gas system and cause serious problems if not removed. At the Savannah River Site's full-scale Defense Waste Processing Facility, a pretreatment unit was installed to reduce nitrates in the feed, and an ammonia scrubber was installed to control ammonia in the off-gas.

Response: Vitrification plant designs have been modified as shown in Volume 2, Section 3.2, Figure 3.2-2, Sheet 1. The off-gas from the melter would first contact a scrubber system operating at an acidic pH, which would scrub any ammonia from the off-gas.

The off-gas scrub column would perform four functions: (1) provide additional cooling of the off-gas; (2) provide additional particulate removal; (3) scrub out any ammonia in the off-gas; and (4) cool and quench hot gases that are diverted around the Venturi scrubber during a process upset.

**RESPONSE TO U.S. EPA TECHNICAL REVIEW COMMENTS ON THE DRAFT FINAL EVALUATION OF SILO 3 ALTERNATIVES, VOLUMES 1 AND 2, DECEMBER 1996 FERNALD ENVIRONMENTAL MANAGEMENT PROJECT FERNALD, OHIO (Cont.)**

Commenting Organization: U.S. EPA Commentor: Saric
Section #: NA Page #: NA Line #: NA
Original General Comment #: 3

Comment: Volume 1 fails to adequately incorporate the impacts of the high sulfate levels in Silo 3 waste and the ability to implement vitrification. Previously, based upon pilot plant testing information, U.S. DOE stated that vitrification of Silo 3 waste could only be successfully implemented if additional materials were blended with the Silo 3 waste to reduce sulfate levels. This would result in significant volume increases of material and costs. This information has not been incorporated in the evaluation of alternatives, to present the most probable path forward if vitrification of Silo 3 waste could occur. The evaluation report continues to compare vitrification and cementation options assuming vitrification appears as an option that can be successfully implemented although U.S. DOE has failed to show that a vitrification facility can be implemented and operated efficiently.

Response: The Silo 3 waste contains relatively high concentrations of sulfates (approximately 15 wt%). The high sulfate concentration in the Silo 3 waste requires high melter operating temperatures (>1,150°C) to assure sulfate destruction, as well as, the addition of reductants to control sulfate layering and sulfate foaming events within the melt pool.

The Fernald Environmental Management Project (FEMP) has evaluated the implementation of the vitrification technology by testing a variety of silo surrogate waste stream formulations as part of the Vitrification Pilot Plant (VITPP) Program. It was observed that although a "blend" of the Silo 1, 2, and 3 waste streams reduced the overall sulfate concentrations of the feedstream, higher melter operating temperatures and the use of reductants were still necessary to control sulfate layering and foaming events within the melt pool. The required higher operating temperatures coupled with the addition of reductants creates a melt pool environment conducive to the formation of molten lead. The relatively high and varying lead content in the Silos 1 and 2 waste, without proper controls, can precipitate in the melter and compromise the integrity of the melter's materials of construction. These process conditions create a high degree of uncertainty in the ability to reliably produce a vitrified waste on a full-scale continuous basis. These phenomena were observed by the Department of Energy (DOE) during the VITPP test runs and were significant causal factors in the December 26, 1996 melter failure. In addition, tests conducted on a "Silo 3 only"

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surrogate waste stream at the Catholic University of America - Vitreous State Laboratory (VSL) in support of the VITPP program observed the same sulfate related issues.

Dilution of the Silo 3 waste to reduce the sulfate content to manageable levels would result in a very large increase in the volume of residues requiring treatment, as wells as, an associated increase in disposal volume, operation and maintenance costs, packaging, transportation, and disposal costs. Although dilution of the Silo 3 waste may be the most reliable method to manage sulfate levels, it is not the most practicable nor the most cost-effective.

While process flow sheets and melters could be developed to successfully vitrify the Silo wastes, the time and cost of developing such a process would be prohibitive. Therefore, it is recommended that the stabilization of the Silo 3 waste be performed separately from Silos 1 and 2 waste. Separating the wastes would significantly reduce the technical uncertainties and programmatic risks of vitrifying Silos 1 and 2 waste, because a lower-temperature, commercially available melter design could be used, thus reducing the uncertainties associated with melt pool chemistry, melter life, and materials of construction.

The DOE is confident that, based on the characteristics of the Silo 3 waste, sufficient knowledge and adequate stabilization technologies exist to produce an immobilized Silo 3 waste form that would satisfy all DOE and environmental regulations and requirements for disposal at the Nevada Test Site (NTS). Thus, it is recommended that the Silo 3 waste not be vitrified either individually or in combination, but be stabilized through another process, such as cementation.

Commenting Organization: U.S. EPA Commentor: Saric
Section #: NA Page #: NA Line #: NA
Original General Comment #: 4
Comment: Volume 2 eliminates Alternative (ALT) 4--removal, on-site blending of Silo 3 waste with Operable Unit (OU)1 Waste Pit 5 material, and off-site disposal at a representative permitted commercial disposal facility--before it is fully evaluated. The report states that the Resource Conservation and Recovery Act does not recognize blending as a substitute for treatment and that implementation of ALT-4 would not be consistent with the Comprehensive

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Environmental Response, Compensation, and Liability Act's preference for permanent and significant reduction of volume, toxicity, or mobility of hazardous substances or contaminated materials. The Silo 3 alternatives evaluation report should fully evaluate ALT-4, including cost and schedule information.

Response: Silo 3 waste is classified as byproduct material as defined by Section 11(e)(2) of the Atomic Energy Act (AEA) of 1954, as amended. Silo 3 waste contains heavy metal constituents that were present in the natural ore, and that were extracted from the parent ore along with the uranium during the extraction process. Leachate from the Silo 3 waste exceeds the toxicity characteristic limits established under 40 CFR § 261.24 for four of these metals: arsenic, cadmium, chromium, and selenium. However, as 11(e)(2) byproduct material, the Silo 3 waste are specifically exempt from regulation as solid waste under the Resource Conservation and Recovery Act (RCRA) 40 CFR § 261.4(a)(4).

Silo 3 waste are being remediated in accordance with the Comprehensive Environmental Response Compensation and Liability Act (CERCLA). Section 121(d) of CERCLA requires that, at the completion of remedial action, the site should achieve a level of control that complies with federal and state environmental laws that are applicable or relevant and appropriate requirements (ARARs) for the hazardous substances, pollutants, or contaminants that remain onsite.

Because Silo 3 waste is exempt from RCRA, the requirements under RCRA are not considered "applicable" to the remediation of the Silo 3 waste. However, Silo 3 waste is considered to be sufficiently similar to hazardous waste, due to exhibiting the toxicity characteristic for arsenic, cadmium, chromium, and selenium. Therefore, certain requirements under RCRA are considered "relevant and appropriate" to the remediation of Silo 3 waste.

The treatment of the Silo 3 waste would be considered a substantive part of the RCRA regulations. Although the AEA 11(e)(2) byproduct material can be blended with other nonhazardous waste material through its exclusion from RCRA requirements, the identification of "relevant and appropriate" requirements that reference the dilution prohibition under RCRA prohibit the blending of Silo 3 waste, with any material, as a treatment option to remove

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a characteristic, since RCRA and CERCLA prohibit blending as a substitute for adequate treatment.

Treatment is defined under 40 CFR § 260.10 as "any method, technique, or process, including neutralization, designed to change the physical, chemical, or biological character or composition of any hazardous waste so as to neutralize such waste, or so as to recover energy or material resources from the waste, or so as to render such waste nonhazardous, or less hazardous; safer to transport; store, or dispose of; or amenable for recovery, amenable for storage, or reduced in volume."

Blending Silo 3 waste with material from the Waste Pits would not be consistent with the CERCLA section 121(b)(1) preference for a remedial alternative that "permanently and significantly reduces the volume, toxicity, or mobility of the hazardous substances or contaminated materials." This section further states, "The off-site transport and disposal of hazardous substances or contaminated materials without such treatment should be the least favored alternative remedial action where practicable treatment technologies are available."

Blending Silo 3 waste with material from the Waste Pits would neither reduce the mobility of the heavy metal contaminants, nor destroy the heavy metal contaminants to reduce the toxicity. Blending would merely dilute the heavy metal contaminants through an increase in total volume to eliminate the toxicity characteristic under RCRA. Practicable stabilization technologies are available for treating the Silo 3 waste that would reduce the mobility of the heavy metal contaminants and eliminate the toxicity characteristic under RCRA.

In addition, it appears that blending Silo 3 waste with either soil or other waste (i.e., Waste Pit 5) would result in Silo 3 waste losing their classification as 11(e)(2) byproduct material. The intent to blend Silo 3 waste with either soil or other waste with the knowledge that the residues would be reclassified as low-level waste would require the residues to be classified and managed as low-level waste prior to blending. Because the Silo 3 waste exhibit the toxicity characteristic, classification as low-level waste would require management as a mixed waste in accordance with all RCRA requirements including the land disposal restrictions.

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Reclassification of Silo 3 waste to low-level mixed waste would result in requirements under RCRA becoming "applicable" to the remediation of the residues. This would also preclude blending from being considered an option for management of the residues, since blending is prohibited as a substitute for adequate treatment.

Alternatives that do not satisfy the two threshold criteria, overall protection of human health and the environment and compliance with ARARs, cannot be carried forward to the primary balancing category and are not eligible to be selected as the final remedy. Since blending Silo 3 waste with other waste material does not comply with all the ARARs, an evaluation under the primary balancing category, including cost and schedule, is not warranted.

Commenting Organization: U.S. EPA  Commentor: Saric
Section #: NA  Page #: NA  Line #: NA
Original General Comment #: 5

Comment: The December 26, 1996, surrogate material leak from the melter, the subsequent videotaping of the corrosion and deterioration within the melter, and the path forward activities involving melter redesign proposed in Volume 1 indicate that a significant level of effort is needed to overcome the current melter's construction and operating deficiencies. The evaluation of Silo 3 alternatives should address these issues and discuss their impact on the OU4 overall remediation schedule and cost.

Response: The December 26, 1996, melter incident heightened the ongoing re-evaluation on the application of the vitrification technology to the Silo 3 waste.

The Silo 3 waste contains relatively high concentrations of sulfates (approximately 15 wt%). The high sulfate concentration in the Silo 3 waste requires high melter operating temperatures (>1,150°C) to assure sulfate destruction, as well as, the addition of reductants to control sulfate layering and sulfate foaming events within the melt pool.

The FEMP has evaluated the implementation of the vitrification technology by testing a variety of silo surrogate waste stream formulations as part of the VITPP Program. It was observed that although a "blend" of the Silo 1, 2, and 3 waste streams reduced the overall sulfate concentrations of the feedstream, higher melter operating temperatures and the use of reductants

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were still necessary to control sulfate layering and foaming events within the melt pool. The required higher operating temperatures coupled with the addition of reductants creates a melt pool environment conducive to the formation of molten lead. The relatively high and varying lead content in the Silos 1 and 2 waste without proper controls can precipitate in the melter and compromise the integrity of the melter's materials of construction. These process conditions create a high degree of uncertainty in the ability to reliably produce a vitrified waste on a full-scale continuous basis. These phenomena were observed by the DOE during the VITPP test runs and were significant causal factors in the December 26, 1996 melter failure. In addition, tests conducted on a "Silo 3 only" surrogate waste stream at the VSL in support of the VITPP program observed the same sulfate related issues.

Dilution of the Silo 3 waste to reduce the sulfate content to manageable levels would result in a very large increase in the volume of residues requiring treatment, as wells as, an associated increase in disposal volume, operation and maintenance costs, packaging, transportation, and disposal costs. Although dilution of the Silo 3 waste may be the most reliable method to manage sulfate levels, it is not the most practicable nor the most cost-effective.

While process flow sheets and melters could be developed to successfully vitrify the Silo wastes, the time and cost of developing such a process would be prohibitive. Therefore, it is recommended that the stabilization of the Silo 3 waste be performed separately from Silos 1 and 2 waste. Separating the wastes would significantly reduce the technical uncertainties and programmatic risks of vitrifying Silos 1 and 2 waste, because a lower-temperature, commercially available melter design could be used, thus reducing the uncertainties associated with melt pool chemistry, melter life, and materials of construction.

The DOE is confident that, based on the characteristics of the Silo 3 waste, sufficient knowledge and adequate stabilization technologies exist to produce an immobilized Silo 3 waste form that would satisfy all DOE and environmental regulations and requirements for disposal at the NTS. Thus, it is recommended that the Silo 3 waste not be vitrified either individually or in combination, but be stabilized through another process, such as cementation.

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Commenting Organization: U.S. EPA Commentor: Saric
Section #: NA Page #: NA Line #: NA
Original General Comment #: 6

Comment: The cost and schedule comparisons presented in volumes 1 and 2 have not been agreed upon by U.S. EPA. Although they are acceptable for comparison purposes, U.S. EPA does not concur with these figures and schedules. Cost and schedule figures provided to the independent review team should be incorporated into the Silo 3 evaluation report, if they are more realistic.

Response: Cost and schedule information for the stabilization/solidification of the Silo 3 waste provided in the "Draft Final Evaluation of Silo 3 Alternatives" report (Silo 3 Report) was used by the Independent Review Team for its evaluation.

**RESPONSE TO U.S. EPA TECHNICAL REVIEW COMMENTS ON THE DRAFT FINAL EVALUATION OF SILO 3 ALTERNATIVES, VOLUMES 1 AND 2, DECEMBER 1996 FERNALD ENVIRONMENTAL MANAGEMENT PROJECT FERNALD, OHIO (Cont.)**

**Specific Comments--Volume 1**

Commenting Organization: U.S. EPA Commentor: Saric
Section #: NA Page #: ES-7 Lines #: 12-14
Original Specific Comment #: 1

Comment: The text states that treatability study results generated for the OU4 remedial investigation and feasibility study indicate that cement stabilization was more effective for immobilizing uranium and thorium isotopes than vitrification. However, comparable supporting analytical data are not presented in either the Executive Summary or subsequent sections. Volume 1 should be revised to include the supporting analytical data, or the text should be revised to reflect the limited nature of the data. Also, see Original Specific Comment 2.

Response: While the untreated and vitrified Silo 3 waste leachate were analyzed for the isotopes of thorium and uranium, the cement stabilized waste leachate was analyzed for total thorium and total uranium. In addition, the isotope data were reported in pCi/L and the total thorium and total uranium data were reported in mg/L. Therefore, a comparison of cement stabilization and vitrification radiological data is based on the assumption that distribution of uranium and thorium isotopes in the toxicity characteristic leaching procedure (TCLP) leachate of the cement stabilized residues is the same as the distribution in the untreated residues.

Based on this assumption, one can estimate the activity for the uranium and thorium isotopes in the cement stabilized leachate using the analytical data obtained for total uranium and thorium and the specific activities for the respective isotopes. Using this information, the uranium and thorium isotopes in the leachate of the cement stabilized Silo 3 waste are estimated to have the following activities: U-238, 2 pCi/L; U-235, 0.1 pCi/L; U-234, 2 pCi/L in Formula 1; and Th-230, 1.4 pCi/L in Formula 2. In comparison, the leachate of the vitrified Silo 3 waste had the following activities: U-238, 95 pCi/L; U-235, 4 pCi/L; U-234, 92 pCi/L; and Th-230, 17 pCi/L. Because the activity levels in the leachate of the cement stabilized waste were lower than those observed for vitrified waste, it was concluded that cement stabilization was more effective than vitrification for immobilizing uranium and thorium isotopes. Attachment 1 presents a table of the data from radiological analyses of the leachate of the vitrified and cement stabilized Silo 3 waste.

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Commenting Organization: U.S. EPA Commentor: Saric
Section #: 2.1 Page #: 2-1 Line #: NA
Original Specific Comment #: 2

Comment: The text states that comparison of toxicity characteristic leaching procedure (TCLP) data for uranium and thorium shows that "cement stabilization was better than vitrification in retaining uranium and thorium." However, Table 2-1, which summarizes TCLP data for vitrified and cement-stabilized Silo 3 waste, presents data for uranium and thorium in untreated and treated Silo 3 waste that do not support this statement. The text should be revised to make it consistent with the available TCLP data.

The text also states that both vitrification and cement-stabilization "performed equally well in the retention of hazardous constituents (lead for K-65; and arsenic, cadmium, chromium, selenium for Silo 3)." First, the reference to the K-65 waste TCLP result for lead should be deleted because Volume 1 focuses on the effectiveness of vitrification and stabilization of Silo 3 waste. Second, except for arsenic results, the TCLP results for the vitrified Silo 3 waste appear to be lower than those for cement-stabilized Silo 3 waste. The text should be revised to accurately reflect these results.

Response: While the untreated and vitrified Silo 3 waste leachate were analyzed for the isotopes of thorium and uranium, the cement stabilized waste leachate was analyzed for total thorium and total uranium. In addition, the isotope data were reported in pCi/L and the total thorium and total uranium data were reported in mg/L. Therefore, a comparison of cement stabilization and vitrification radiological data is based on the assumption that distribution of uranium and thorium isotopes in the TCLP leachate of the cement stabilized residues is the same as the distribution in the untreated residues.

Based on this assumption, one can estimate the activity for the uranium and thorium isotopes in the cement stabilized leachate using the analytical data obtained for total uranium and thorium and the specific activities for the respective isotopes. Using this information, the uranium and thorium isotopes in the leachate of the cement stabilized Silo 3 waste are estimated to have the following activities: U-238, 2 pCi/L; U-235, 0.1 pCi/L; U-234, 2 pCi/L in Formula 1; and Th-230, 1.4 pCi/L in Formula 2. In comparison, the leachate of the vitrified Silo 3 waste had the following activities: U-238, 95 pCi/L; U-235, 4 pCi/L; U-234, 92 pCi/L; and Th-230, 17 pCi/L. Because the activity levels in the leachate of the cement stabilized waste were lower than those observed for vitrified waste, it was concluded that cement stabilization was more effective than vitrification for immobilizing uranium and thorium

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isotopes. Attachment 1 presents a table of the data from radiological analyses of the leachate of the vitrified and cement stabilized Silo 3 waste.

The analytical data for metals is expressed as "dilution adjusted" which is an attempt to reflect leaching in terms of the volume increase associated with the cement stabilization process. The actual measured leach rate in the cement stabilized waste form is about half of the dilution adjusted value for any given metal. Attachment 2 presents a table of data from analysis of metals in the leachate of the vitrified and cement stabilized Silo 3 waste which have not been "dilution adjusted." When analytical data is understood in this context, the leach rate for both the vitrified waste form and the Formula 2 cement stabilized waste form are essentially the same.

Commenting Organization: U.S. EPA    Commentor: Saric
Table #: 2-1    Page #: 2-2    Line #: NA
Original Specific Comment #: 3

Comment: This table presents TCLP data for vitrified and cement-stabilized Silo 3 waste. The Formula 2 cement-stabilized residue TCLP result for total thorium is 0.013 milligram per liter (mg/L). However, Footnote f lists this value as 0.0013 mg/L. Also, the untreated Silo 3 residue extraction procedure toxicity concentration for arsenic is listed in the table as 45 mg/L. However, the correct value appears to be 42 mg/L. These discrepancies should be resolved. In addition, for each "not detected" (ND) entry, the detection limit should be provided in parentheses. This original specific comment also applies to Table 3-2.

Response: Agreed. In Table 2-1, the correct TCLP result for total thorium in Formula 2 should be 0.0013 mg/L and the correct TCLP for arsenic in the untreated Silo 3 waste should be 42 mg/L.

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Commenting Organization: U.S. EPA Commentor: Saric
Table #: 3-1 Page #: 3-2 Line #: NA
Original Specific Comment #: 4

Comment: This table presents a comparative cost analysis summary for Silo 3 alternatives VIT and ALT-1. Cost information for the VIT alternative was taken from the Vitrification Pilot Plant (VITPP) Analysis Report dated September 1996; cost information for the ALT-1 alternative was taken from Volume 2 of the Final Evaluation of Silo 3 Alternatives Report dated December 1996. According to Table 3-1, the total capital and present worth costs for the VIT alternative are $65.8 million and $61.1 million, respectively. However, Appendix C of Volume 2 presents total capital and present worth costs for the VIT alternative of $24.8 million and $20.4 million, respectively. The text or Table 3-1 should be revised to (1) explain why the capital and present worth costs in the September 1996 VITPP analysis report were used instead of those in Volume 2 and (2) resolve the apparent discrepancy.

Also, Table 3-1 lists the total capital cost for ALT-1 as $19.5 million. However, Appendix C of Volume 2 refers to this cost as the total life cycle cost. Table 3-1 should be revised to be consistent with Appendix C of Volume 2.

This original specific comment also applies to Table 3-8.

Response: As requested at the EPA/DOE Silos Project meeting conducted on October 30, 1996, the Silo 3 Report was revised to include Volume 1, which introduced the comparison of a more representative vitrification alternative for the Silo 3 waste. The new vitrification alternative presented in Volume 1 allowed a more direct "apples to apples" comparison to the potential stabilization/solidification alternatives presented in Volume 2.

The new vitrification alternative in Volume 1 provided a more meaningful comparison, based on current information, than the original Silo 3 vitrification alternative in Volume 2 because the costs associated with the vitrification of Silo 3 waste presented in Volume 2 of the document assumed the Silo 3 waste would be blended with waste from Silos 1 and 2. Volume 2 also assumed the construction and use of a 25-tonne per day vitrification facility for remediation of the Silos waste. Because of the difficulties presented by Silo 3 waste during vitrification, it was decided to remediate Silo 3 waste independent of the waste from Silos 1 and 2.

**RESPONSE TO U.S. EPA TECHNICAL REVIEW COMMENTS ON THE DRAFT FINAL EVALUATION OF SILO 3 ALTERNATIVES, VOLUMES 1 AND 2, DECEMBER 1996 FERNALD ENVIRONMENTAL MANAGEMENT PROJECT FERNALD, OHIO (Cont.)**

In addition, the September 1996 VITPP analysis report also indicated it may be more cost-effective to upgrade the existing Pilot Plant to a 6-tonne per day facility and construct other mini-melters to achieve a capacity of approximately 20-tonnes per day. To provide an "apples to apples" comparison between vitrification and cement stabilization of the Silo 3 waste, the cost information provided in the September 1996 VITPP analysis was used with the assumption that Silo 3 waste would be remediated prior to waste from Silos 1 and 2.

The "Header" in Table 3-1 should read "Total Life Cycle Cost."

Commenting Organization: U.S. EPA — Commentor: Saric
Section #: 3.1.2 — Page #: 3-5 — Line #: NA
Original Specific Comment #: 5

Comment: This section describes the ALT-1 alternative. The text states that Silo 3 waste would undergo stabilization and solidification (S/S) in which the residues would be mixed with portland cement and other additives to produce a waste product that meets the disposal facility's specific waste acceptance criteria (WAC). The text further states that the waste product would be a "monolithic waste cast into a [*sic*] metal boxes" and that it would be tested to determine whether it meets WAC.

First, the text should discuss the need for use of a sulfate-resistant portland cement (Type V) during S/S because of the relatively high sulfate levels present in the Silo 3 waste. Second, the text should describe proposed procedures for collecting samples of the monolith from its container for TCLP, WAC, and other testing. Third and finally, the text should address how the monolith's long-term integrity will be evaluated in addition to WAC testing.

Response: Treatability studies on actual Silo 3 waste conducted during the OU4 FS found stabilization (cementation) to be a viable remediation alternative. The reagents tested included portland cement Type II because of the expected levels of sulfate in the waste. As part of the Request-for-Proposal (RFP) process for remediation of the Silo 3 waste, interested qualified subcontractors would be required to submit information detailing their proposed treatment technology. They would also have to demonstrate through proof-of-process, that their technology would be capable of successfully treating Silo 3 waste to meet the disposal facility's waste acceptance criteria (WAC). The selected subcontractor would also be

**RESPONSE TO U.S. EPA TECHNICAL REVIEW COMMENTS ON THE DRAFT FINAL EVALUATION OF SILO 3 ALTERNATIVES, VOLUMES 1 AND 2, DECEMBER 1996 FERNALD ENVIRONMENTAL MANAGEMENT PROJECT FERNALD, OHIO (Cont.)**

required to develop a Process Control Plan and Sampling and Analysis Plan for controlling key parameters of the process and performing sampling techniques to ensure representative samples are collected and that treated materials meet the disposal facility WAC.

The regulatory agencies and stakeholders will be given the opportunity to review the draft RFP to ensure all necessary regulatory, technical, and administrative performance requirements are addressed.

Commenting Organization: U.S. EPA Commentor: Saric
Table #: 3-2 Page #: 3-8 Line #: NA
Original Specific Comment #: 6
Comment: See Original Specific Comment No. 3.

Response: Agreed. In Table 3-2, the correct TCLP result for total thorium in Formula 2 should be 0.0013 mg/L and the correct TCLP for arsenic in the untreated Silo 3 waste should be 42 mg/L.

Commenting Organization: U.S. EPA Commentor: Saric
Section #: 3.3.3.1 Page #: 3-18 Line #: NA
Original Specific Comment #: 7
Comment: This section discusses Campaign 2 vitrification testing. The last sentence in the second paragraph refers to processing difficulties caused by high sulfate levels during Campaign 2 testing. However, the text does not present the sulfate levels in the residues undergoing vitrification testing in Campaign 2. The text should be revised to clearly summarize the sulfate level in each Campaign 2 waste residue undergoing vitrification testing and cite a reference for the sulfate levels.

Response: The sulfate levels used during Campaign 2 testing ranged from 2.9% to 4%.

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Commenting Organization: U.S. EPA Commentor: Saric
Section #: 3.3.3.3 Page #: 3-22 Line #: NA
Original Specific Comment #: 8
Comment: This section discusses the implementation schedule for the VIT and ALT-1 alternatives. The text states that the expected completion date for the vitrification treatment operation is April 2002 and that decontamination and decommissioning (D&D) would not be completed until September 2003. However, Figure 3-4 indicates that the vitrification treatment operation would be completed by April 2003 and that D&D would be completed by September 2004. Volume 1 should be revised to resolve these discrepancies.

Response: Agreed. The expected completion date for vitrification treatment operation should be April 2003 and the expected completion date for decontamination and demolition should be September 2004.

Commenting Organization: U.S. EPA Commentor: Saric
Table #: 3-8 Page #: 3-26 Line #: NA
Original Specific Comment #: 9
Comment: See Original Specific Comment No. 4.

Response: As requested at the EPA/DOE Silos Project meeting conducted on October 30, 1996, the Silo 3 Report was revised to include Volume 1, which introduced the comparison of a more representative vitrification alternative for the Silo 3 waste. The vitrification alternative presented in Volume 1 allowed a more direct "apples to apples" comparison to the potential stabilization/solidification alternatives presented in Volume 2.

The new vitrification alternative in Volume 1 provided a more meaningful comparison, based on current information, than the original Silo 3 vitrification alternative in Volume 2 because the costs associated with the vitrification of Silo 3 waste presented in Volume 2 of the document assumed the Silo 3 waste would be blended with waste from Silos 1 and 2. Volume 2 also assumed the construction and use of a 25-tonne per day vitrification facility for remediation of the Silos waste. Because of the difficulties presented by Silo 3 waste during vitrification, it was decided to remediate Silo 3 waste independent of the waste from Silos 1 and 2.

In addition, the September 1996 VITPP analysis report also indicated it may be more cost-effective to upgrade the existing Pilot Plant to a 6-tonne per day facility and construct other mini-melters to achieve a capacity of

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approximately 20-tonnes per day. To provide an "apples to apples" comparison between vitrification and cement stabilization of the Silo 3 waste, the cost information provided in the September 1996 VITPP analysis was used with the assumption that Silo 3 waste would be remediated prior to waste from Silos 1 and 2.

The "Header" in Table 3-1 should read "Total Life Cycle Cost."

Commenting Organization: U.S. EPA Commentor: Saric
Section #: 4.0 Page #: 4-4 Line #: NA
Original Specific Comment #: 10
Comment: The text discusses S/S and implies that Silo 3 waste are homogeneous. The text should be revised to distinguish between Silo 3 residue chemical constituents, which are expected to vary, and physical parameters such as moisture content and particle size, which are expected to be relatively uniform.

Response: Agreed. Although considered generally homogeneous in nature, the Silo 3 waste chemical and radiological concentrations do vary, as evidenced by the sampling data ranges presented in Tables 1.4-1 through 1.4-8. Similarly, the physical properties of the Silo 3 waste have been measured and they vary slightly as well (i.e., moisture content ranges between 3.7 and 10.2 percent and approximately 90 percent of the particle sizes are below 0.075 mm in diameter). The range of physical and chemical characteristics is reflective of the variability of the natural raw ore and the extraction process in the current storage configuration.

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**Specific Comments--Volume 2**

Commenting Organization: U.S. EPA Commentor: Saric
Table #: ES-1 Page #: ES-7 Line #: NA
Original Specific Comment #: 11

Comment: This table summarizes the comparative analysis of five Silo 3 alternatives: VIT, ALT-1, ALT-2, ALT-3, and ALT-4. The fifth column indicates whether each alternative reduces the toxicity, mobility, or volume of hazardous waste constituents through treatment. This column indicates that ALT-1 through ALT-3, the S/S alternatives, reduce the toxicity and mobility of hazardous constituents. However, Table 4.2-1 on Page 4-3 indicates that ALT-1 through ALT-3 reduce only mobility. Because S/S technologies immobilize but do not destroy or chemically alter hazardous constituents, the fifth column in Table ES-1 should be revised to delete reference to toxicity reduction for ALT-1 through ALT-3.

Response: Agreed. Stabilization/solidification only reduces the mobility of the hazardous constituents in the waste. Although immobilization of the heavy metal constituents results in the elimination of the toxicity characteristic, it does not destroy or chemically alter the hazardous constituents. Therefore, toxicity of the waste is not reduced by stabilization/solidification.

Commenting Organization: U.S. EPA Commentor: Saric
Table #: ES-3 Page #: ES-9 Line #: NA
Original Specific Comment #: 12

Comment: This table summarizes short-term mechanical and transportation risks for Silo 3 alternatives. The table and the associated text should be revised to include radiation risks and radon impacts, which are presented in Appendix D.

Response: Although radiological risks and radon impacts to onsite workers were not included in Table ES-3, they were used in the evaluation of the alternatives against the National Oil and Hazardous Substances Pollution Contingency Plan evaluation criteria. The lifetime cancer risk to the maximally exposed individual represents the radiological risks to the public resulting from exposure during transportation of the Silo 3 waste.

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Commenting Organization: U.S. EPA Commentor: Saric
Section #: 3.2.4 Page #: 3-42 Lines #: 8-9
Original Specific Comment #: 13
Comment: This section discusses reduction of toxicity, mobility, or volume through treatment. Lines 8 and 9 state that reducing the mobility of radionuclides would also reduce their toxicity. This statement should be deleted from the text because treatment does not destroy radionuclides; it only reduces their mobility.

Response: Agreed. Vitrification would reduce the mobility of the hazardous constituents and potentially the volume of the Silo 3 waste requiring disposal. Although immobilization of the heavy metal constituents results in the elimination of the toxicity characteristic, it does not destroy or chemically alter the hazardous constituents. Therefore, toxicity of the waste is not reduced by vitrification.

Commenting Organization: U.S. EPA Commentor: Saric
Section #: 3.2.6 Page #: 3-45 Line #: 29
Original Specific Comment #: 14
Comment: This section discusses risks associated with implementation of remedial alternatives for OU4. Line 29 indicates that 0.08 deaths are estimated during remediation. However, Appendix D, Table D.4-3 indicates that 0.09 deaths are estimated. This discrepancy should be resolved.

Response: The correct value should be 0.09 deaths.

Commenting Organization: U.S. EPA Commentor: Saric
Sections #: 3.3.5, 3.4.5, and 3.5.5 Page #: 3-45 Line #: NA
Original Specific Comment #: 15
Comment: These sections discuss the short-term effectiveness of the remedial alternatives. The first paragraph of each section includes one sentence stating that risks were calculated as shown in Appendix D and were found to be acceptable. Later in the same paragraph, specific numbers of estimated transportation-related injuries and deaths associated with the remedial alternatives are presented, implying that the estimated number of injuries and deaths were found to be acceptable. To avoid this implication, the phrase discussing the acceptability of risks should be deleted.

Response: Agreed. The statement regarding the acceptability of risk refers to a comparison of the calculated risks in Appendix D to the CERCLA incremental lifetime cancer risk range of $10^{-4}$ to $10^{-6}$. This does not imply that injuries or

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deaths will be acceptable to the DOE during remediation activities. Technical editing performed on future documentation will ensure that sensitivity to discussions involving the acceptability of public risk is maintained.

Commenting Organization: U.S. EPA Commentor: Saric
Section #: Appendix E, Section E-2-3 Page #: NA Line #: NA
Original Specific Comment #: 16
Comment: Appendix E discusses treatability study issues. One issue that should be discussed in this appendix is the relatively high sulfate levels in Silo 3 waste and the need for using a sulfate-resistant portland cement (Type V). Another issue that should be addressed involves long-term integrity testing of the treated Silo 3 waste in addition to WAC compliance testing. The text should be revised to address these issues.

Response: Treatability studies on actual Silo 3 waste conducted during the OU4 FS found stabilization (cementation) to be a viable remediation alternative. The reagents tested included portland cement Type II because of the expected levels of sulfate in the waste. The treatment systems described in the Silo 3 Report are based on data from the OU4 FS and have been developed as a viable way to implement remediation of Silo 3 waste. Equivalent systems may exist and are not precluded from consideration during remedial design, including the use of subcontractor-supplied treatment systems and services.

DOE proposes that the remediation of Silo 3 waste be completed by a commercial vendor experienced in stabilization/solidification techniques. A RFP process would be used to procure a vendor to perform remediation of Silo 3 waste. The fixed-fee contract would require the subcontractor to be responsible for the overall project including cost, schedule, equipment, and chemical additives. Before design of process equipment, the subcontractor would be required to perform proof-of-process testing on actual Silo 3 waste to demonstrate that the process works to specified WAC.

## ATTACHMENT 1 - TREATMENT TECHNOLOGY COMPARISON FOR IMMOBILIZATION OF RADIOLOGICAL CONSTITUENTS

| | Untreated | Vitrification | Stabilization[a] | |
|---|---|---|---|---|
| Radiological Constituents | | | Formula 1 | Formula 2 |
| Lead-210 | 87 pCi/L | 55 pCi/L | 360 pCi/L | 7 pCi/L |
| Radium-226 | 2,455 pCi/L | 45 pCi/L | 1,710 pCi/L | 760 pCi/L |
| Thorium-230 | 10 pCi/L | 17 pCi/L | < 1.1 pCi/L | 1.4 pCi/L |
| Uranium-233/234 | 92 pCi/L | 92 pCi/L | 2 pCi/L | < 0.34 pCi/L |
| Uranium-235/236 | 5 pCi/L | 4 pCi/L | 0.1 pCi/L | < 0.02 pCi/L |
| Uranium-238 | 86 pCi/L | 95 pCi/L | 2 pCi/L | <0.34 pCi/L |

[a] Two stabilization/solidification formulations were tested on the Silo 3 waste during the OU4 FS treatability studies. Results from both formulations are presented.

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## ATTACHMENT 2 - TREATMENT TECHNOLOGY COMPARISON FOR IMMOBILIZATION OF HEAVY METAL CONSTITUENTS

| | Untreated | Vitrification | Stabilization[b] | |
|---|---|---|---|---|
| Hazardous Constituents | | | Formula 1 | Formula 2 |
| Arsenic (Regulatory Limit 5 mg/L)[a] | 1- 42 | 0.6 mg/L | 0.045 mg/L | 0.045 mg/L |
| Cadmium (Regulatory Limit 1 mg/L)[a] | 1 - 6 | 0.009 mg/L | 0.0025 mg/L | 0.0025 mg/L |
| Chromium (Regulatory Limit 5 mg/L)[a] | 1 - 12 | < 0.01 mg/L | 0.5 mg/L | 0.03 mg/L |
| Selenium (Regulatory Limit 1 mg/L)[a] | 1 - 12 | < 0.002 mg/L | 0.17 mg/L | 0.12 mg/L |

[a] Regulatory Limit for Arsenic, Cadmium, Chromium, and Selenium under 40 CFR § 261.24 of the Resource Conservation and Recovery Act.

[b] Two stabilization/solidification formulations were tested on the Silo 3 waste during the OU4 FS treatability studies. Results from both formulations are presented.

**RESPONSE TO OEPA COMMENTS ON THE
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**RESPONSE TO OEPA COMMENTS ON THE DRAFT FINAL EVALUATION OF SILO 3 ALTERNATIVES, VOLUMES 1 AND 2, DECEMBER 1996**

**VOLUME 1**

Commenting Organization: Ohio EPA Commentor: OFFO
Section #: General Comment Page #: n/a Line #: n/a Code: C
Original Comment #: 1
Comment: What are the specific requirements for IP-2 containers for shipment?

Response: IP-2 containers must meet the design criteria specified in Department of Transportation requirements under 49 CFR § 173.411(b)(2). These criteria include, but are not limited to, the following:

- Ability of package to be easily handled and properly secured during transport.
- Lifting attachments that are a structural part of the package must be designed with a minimum safety factor of three against yielding when package is lifted in intended manner, and must be designed so that failure of any lifting attachment under excessive load would not impair the ability of the package to meet other design requirements.
- The external surface will be free of any protruding features and will be easily decontaminated.
- The outer layer of packaging will avoid pockets or crevices where water might collect.
- Any feature added to the package will not reduce the safety of the package.
- The package will be capable of withstanding the effects of any acceleration, vibration or vibration resonance that may arise under normal conditions of transport.
- The materials of construction of the packaging and any components or structure will be physically and chemically compatible with each other and with the package contents. The behavior of the packaging and the package contents under irradiation will be taken into account.
- All valves through which the package contents could escape will be protected against unauthorized operation.

**RESPONSE TO OEPA COMMENTS ON THE DRAFT FINAL EVALUATION OF SILO 3 ALTERNATIVES, VOLUMES 1 AND 2, DECEMBER 1996 (cont'd)**

- When subjected to the drop test [49 CFR § 173.465(c)] and stacking test [49 CFR § 173.465(d)] must prevent loss or dispersal of the radioactive contents, and must prevent a greater than 20 percent increase in the radiation levels recorded or calculated at the external surfaces for the condition before the test.

Commenting Organization: Ohio EPA Commentor: OFFO
Section #: ES Page #: ES-1 Line #: n/a Code: C
Original Comment #: 2
Comment: The basis for the cost analysis does include the associated costs in the design of a full scale vitrification plant with the necessary design to accommodate Silo 3 wastes. In general, we do not agree with the cost comparison methods; regardless, we agree that a different method for handling Silo 3 wastes is warranted.

Response: The need to revise the selected remedy for the Silo 3 waste arises from several technical issues and the cost and schedule impacts associated with their uncertainty, which remained after the completion of the Vitrification Pilot Plant (VITPP) testing program. The "Draft Final Evaluation of Silo 3 Residues Alternatives" report (Silo 3 Report) summarizes and/or incorporates by references these technical issues, evaluates and computes alternative stabilization/solidification methods for the Silo 3 waste. The Department of Energy (DOE) acknowledges that although the Ohio Environmental Protection Agency (OEPA) may not agree with the cost comparison methods, it agrees with DOE that a different method for the handling of the Silo 3 waste is warranted.

Commenting Organization: Ohio EPA Commentor: OFFO
Section #: 3.0 Page #: 3-1 Line #: Para 1 Code: C
Original Comment #: 3
Comment: The comparative analysis section should specifically mention the alternative of removal, off-site treatment and disposal.

Response: Volume 2 of the Silo 3 Report presents a comparison of the following alternatives for Silo 3 waste:

- VIT - Removal, Onsite Vitrification, Off-site Disposal at the Nevada Test Site (NTS);
- ALT1 - Removal, Onsite Stabilization, Off-site Disposal at the NTS;
- ALT2 - Removal, Onsite Stabilization, Off-site Disposal at a Representative Permitted Commercial Disposal Facility (RPCDF); and

**RESPONSE TO OEPA COMMENTS ON THE DRAFT FINAL EVALUATION OF SILO 3 ALTERNATIVES, VOLUMES 1 AND 2, DECEMBER 1996 (cont'd)**

- ALT3 - Removal, Off-site Stabilization and Disposal at the RPCDF.

Because of the technical issues involving blending Silo 3 waste with Silos 1 and 2 waste during vitrification, it was decided that this report would assume Silo 3 waste would be vitrified separately from Silos 1 and 2 waste. In addition, since Volume 2 of this report indicated there was no significant difference from either a health and safety or cost comparison between onsite and off-site treatment of the Silo 3 waste, ALT1 is being used as a representative stabilization alternative.

The two alternatives are base cases since the Silo 3 waste could be treated by either vitrification or stabilization, and at either an onsite or an off-site treatment facility. In addition, if the Silo 3 waste are treated by vitrification or stabilization separate from Silos 1 and 2 waste, then both treated Silo 3 waste forms also could be disposed at either the NTS or a RPCDF.

In Volume 1, only one stabilization alternative (onsite treatment) was evaluated in order to present an "apples to apples" comparison and focus the discussion on which treatment technology, stabilization or vitrification, would be better suited for treatment of the Silo 3 waste. The intent of limiting the discussion to this alternative was not to eliminate the potential for off-site treatment of the Silo 3 waste.

A decision on the best location for treatment of the Silo 3 waste, either onsite or off-site, will be based on technical and cost merits in accordance with regulatory approval and stakeholder acceptance. If the Request-for-Proposal (RFP) process selects an alternative that identifies final treatment off-site to meet the disposal facility's waste acceptance criteria (WAC), initial treatment of the Silo 3 waste at the Fernald Environmental Management Project (FEMP) will be required prior to their shipment off-site. Initial treatment would be required to reduce the dispersibility of the Silo 3 waste in order to meet design and control requirements for DOE-site worker protection under 10 CFR Part 835 Subpart K.

**RESPONSE TO OEPA COMMENTS ON THE DRAFT FINAL EVALUATION OF SILO 3 ALTERNATIVES, VOLUMES 1 AND 2, DECEMBER 1996 (cont'd)**

Commenting Organization: Ohio EPA Commentor: OFFO
Section #: 3.1.2 Page #: 3-5 Line #: Para 2 Code: C
Original Comment #: 4

Comment: This section states the material that does not meet the WAC of the disposal facility will be reprocessed. How would a monolith and/or 55-gallon drum of concrete be reprocessed? Would this reprocessing pose a significant cost to the onsite facility?

Response: To minimize the need for reprocessing any material that does not meet the WAC of the disposal facility, the subcontractor will be required to demonstrate proof-of-process on actual Silo 3 waste before being awarded the remaining portion of the contract for the remediation of the Silo 3 contents. In addition, the selected subcontractor would develop a process control plan and a sampling and analysis plan that would identify the parameters to be monitored to ensure treated materials meet the disposal facility WAC. The RFP also would require the selected subcontractor to reprocess, at the subcontractor's own expense, any treated Silo 3 waste that do not meet the disposal facility WAC. Reprocessing of the off-specification treated waste would be addressed by the subcontractor's remedial design documentation (i.e., equipment layout, process control plan) and operations procedures. The subcontractor's process, waste form, and packaging will dictate the necessary steps required to reprocess off-specification material (i.e., size reduction, pretreatment, mixing, repackaging, etc.).

Commenting Organization: Ohio EPA Commentor: OFFO
Section #: 3.3.3.2 Page #: 3-20 Line #: Para 2 Code: C
Original Comment #: 5

Comment: Should lid heaters be included in the list of components that will need to be modified for future designs?

Response: The Lid heaters should not be included in the list of components that will need to be modified for future designs. The lid heaters were installed to supply sufficient heat during startup activities to bring the initial temperature of the melter gradually up to 800 - 900°C, at which point the joule-heating electrodes could be brought on line and take over. The lid heaters performed quite well for the VITPP melter concept. Consideration of modifying the lid heaters would only be required, if the new melter design moved away from the joule-heated concept.

**RESPONSE TO OEPA COMMENTS ON THE DRAFT FINAL EVALUATION OF SILO 3 ALTERNATIVES, VOLUMES 1 AND 2, DECEMBER 1996 (cont'd)**

Commenting Organization: Ohio EPA Commentor: OFFO
Section #: 3.3.4 Page #: 3-25 Line #: Table 3-7 Code: C
Original Comment #: 6

Comment: The risks stated for intermodal transport of the wastes are higher for nearly every category listed in the table. What assumptions were used to calculate these risks? And, which of these assumptions caused these risks to be relatively high?

Response: The assumptions for determining the risks associated with direct truck and intermodal shipments were presented in the text below Table 3-7 on pages 3-25 and 3-26 and are listed below:

- Total number of containers needing shipment - 2,160.
- Number of containers per direct truck shipment - 4. Total number of direct truck shipments - 540.
- Number of containers per Sea/Land container - 4 (based on limit for truck). Number of Sea/Lands per railcar - 3. Total number of railcars required for shipment - 180. It is assumed that 20 railcars of treated Silo 3 waste would be added onto a rail shipment of Operable Unit 1 waste pit material going to the RPCDF. The treated Silo 3 waste would be transferred to truck in Salt Lake City, Utah. Total number of rail shipments (20 railcars each), to Salt Lake City, Utah - 9. Total number of truck shipments from Salt Lake City, Utah to the NTS - 540.
- Estimated mileage from Fernald to the NTS by direct truck - 2,065.
- Estimated mileage from Fernald to Salt Lake City, Utah by rail - 2,000. Estimated mileage from Salt Lake City, Utah to the NTS by truck - 500.
- Risk Factors for truck shipments:

| | |
|---|---|
| Worker Injury: | $4.1 \times 10^{-8}$ injuries per mile |
| Worker Fatality: | $2.1 \times 10^{-9}$ injuries per mile |
| Public Injury: | $1.2 \times 10^{-7}$ injuries per mile |
| Public Fatality: | $1.3 \times 10^{-8}$ injuries per mile |

**RESPONSE TO OEPA COMMENTS ON THE DRAFT FINAL EVALUATION OF SILO 3 ALTERNATIVES, VOLUMES 1 AND 2, DECEMBER 1996 (cont'd)**

- Risk Factors for rail shipments:

| | |
|---|---|
| Worker Injury: | 4.6 x $10^{-6}$ injuries per mile |
| Worker Fatality: | 4.8 x $10^{-8}$ injuries per mile |
| Public Injury: | 6.8 x $10^{-6}$ injuries per mile |
| Public Fatality: | 1.8 x $10^{-6}$ injuries per mile |

The risk numbers associated with intermodal transport are impacted by a combination of the higher risk factors associated with rail shipments, the limited number of railcars that could be used for shipment of Silo 3 waste without impacting Operable Unit 1 rail shipments, and the limited number of containers that can be placed in a Sea/Land to comply with weight limitations for over the road shipments. The combination of these three factors negates the benefits that is typically provided by rail shipments.

Although current information indicates there is neither a health and safety nor a cost advantage for using intermodal shipments to the NTS rather than direct truck shipments to the NTS, as stated on page 3-1 of Volume 1 of the Silo 3 Report, the use of intermodal shipments to the NTS, as well as direct rail shipments to the RPCDF, will continue to be evaluated along with direct truck shipments. The selected mode of transportation will be based on an evaluation of risk, logistics, cost and stakeholder acceptance.

Commenting Organization: Ohio EPA Commentor: OFFO
Section #: 3.3.5.1 Page #: 3-28 Line #: Para 4 Code: C
Original Comment #: 7
Comment: Please define "risk budget."

Response: The risk budget is an important and standard cost element used in all cost estimates generated at the FEMP. The risk budget is a cost element based on a risk analysis calculated to cover the statistical probability of an overrun/underrun to the project based upon information available at the time of the estimate. The risk budget would vary depending upon the uncertainty and level of detail available at the time when the estimate was performed.

**RESPONSE TO OEPA COMMENTS ON THE
DRAFT FINAL EVALUATION OF SILO 3 ALTERNATIVES,
VOLUMES 1 AND 2, DECEMBER 1996 (cont'd)**

Commenting Organization: Ohio EPA Commentor: OFFO
Section #: 3.3.5.2 Page #: 3-29 Line #: General Code: C
Original Comment #: 8

Comment: There is no discussion in this section about the cost associated for off-site treatment and disposal. Volume I of this report should give equal time to this alternative, since this is the volume which will be more widely read.

Response: Although the scope of the Volume 1 evaluation of alternatives for the Silo 3 waste is limited to a discussion on the removal, onsite treatment, and off-site disposal of the Silo 3 waste (Alternative 1), the intent of limiting the discussion to this alternative was not to eliminate the potential for off-site treatment of the Silo 3 waste.

As presented in Volume 2 of the Silo 3 Report, there would be no significant difference from either a health and safety or cost comparison between the onsite and off-site treatment of the Silo 3 waste. In Volume 1, only one stabilization alternative (onsite treatment) was evaluated in order to present an "apples to apples" comparison and focus the discussion on which treatment technology, stabilization or vitrification, would be better suited for treatment of the Silo 3 waste.

A decision on the best location for treatment of the Silo 3 waste, either onsite or off-site, would be based on technical and cost merits in accordance with regulatory approval and stakeholder acceptance. If the RFP process selects an alternative that identifies final treatment off-site to meet the disposal facility's WAC, initial treatment of the Silo 3 waste at the FEMP will be required prior to their shipment off-site. Initial treatment would be required to reduce the dispersibility of the Silo 3 waste in order to meet design and control requirements for DOE-site worker protection under 10 CFR Part 835 Subpart K.

**RESPONSE TO OEPA COMMENTS ON THE DRAFT FINAL EVALUATION OF SILO 3 ALTERNATIVES, VOLUMES 1 AND 2, DECEMBER 1996 (cont'd)**

Commenting Organization: Ohio EPA Commentor: OFFO
Section #: 4.0 Page #: 4-2 Line #: 13 Code: C
Original Comment #: 9

Comment: The radon flux listed under the stabilization column is very near the 20 pCi/m$^2$-sec limit. Is this number an estimate, or have tests been conducted to verify that the radon flux from stabilization will be less than the regulatory limit.

Response: The radon flux for stabilized Silo 3 waste presented in Table ES-1 and Table 4-1 was from data obtained from bench-scale treatability studies performed on Silo 3 waste during the Operable Unit 4 Remedial Investigation/Feasibility Study. The flux listed in the two tables does not take credit for radon attenuation provided by the disposal container and the depth of disposal.

The primary goal of the stabilization/solidification process would be to immobilize the Resource Conservation and Recovery Act metals present in the Silo 3 waste. Since compliance with the 20 pCi/m$^2$-sec radon flux rate limit, established under 40 CFR Part 61 Subpart Q, is only required to be met at the disposal facility or interim storage facility, one of the secondary goals of the stabilization/solidification process would be to reduce the emanation rate of radon to as low as reasonably achievable to minimize the engineering controls that might be needed at the interim storage facility and the disposal facility. The proposed disposal container and disposal configuration would offer the necessary engineering controls to meet the 20 pCi/m$^2$-sec flux rate limit for radon emanation.

Commenting Organization: Ohio EPA Commentor: OFFO
Section #: 4.0 Page #: 4-3 Line #: 13 Code: E
Original Comment #: 10

Comment: This footnote incorrectly references the regulatory limit for radon-222 flux as being from 50 CFR Subpart Q. Change to read 40 CFR Subpart Q.

Response: Agreed. The footnotes for Table ES-1 and Table 4-1 (Volume 1) should read 40 CFR Part 61 Subpart Q.

# RESPONSE TO OEPA COMMENTS ON THE DRAFT FINAL EVALUATION OF SILO 3 ALTERNATIVES, VOLUMES 1 AND 2, DECEMBER 1996 (cont'd)

## VOLUME 2

Commenting Organization: Ohio EPA    Commentor: OFFO
Section #: 2.5    Page #: 2-5    Line #: Para 2    Code: C
Original Comment #: 11
Comment: Off-site stabilization and disposal at a representative commercial disposal facility is listed as an alternative in the path forward section of this document. Why is it not included as an option in Volume 1?

Response: Although the scope of Volume 1 of the Silo 3 Report is limited to a discussion on the removal, onsite treatment, and off-site disposal of the Silo 3 waste (Alternative 1), the intent of limiting the discussion to this alternative was not to eliminate the potential for off-site treatment of the Silo 3 waste.

As presented in Volume 2 of the Silo 3 report, there is no significant difference from either a health and safety or cost comparison between the onsite and off-site treatment of the Silo 3 waste. In Volume 1, only one stabilization/solidification alternative (onsite treatment) was evaluated in order to present an "apples to apples" comparison and focus the discussion on which treatment technology, stabilization or vitrification, would be better suited for treatment of the Silo 3 waste.

A decision on the best location for treatment of the Silo 3 waste, either onsite or off-site, would be based on technical and cost merits in accordance with regulatory approval and stakeholder acceptance. If the RFP process selects an alternative that identifies final treatment off-site to meet the disposal facility's WAC, initial treatment of the Silo 3 waste at the FEMP will be required prior to their shipment off-site. Initial treatment would be required to reduce the dispersibility of the Silo 3 waste in order to meet design and control requirements for DOE-site worker protection under 10 CFR Part 835 Subpart K.

Commenting Organization: Ohio EPA    Commentor: OFFO
Section #: 3.2.1.1    Page #: 3-20    Line #: 2    Code: C
Original Comment #: 12
Comment: If Silo 3 contents are best described as being dry and powdery, why is an auger and then a delumper/crusher needed for material removal from the silos?

Response: Since the waste has been stored in Silo 3 for over 40 years, there is the potential for residues to agglomerate or clump together, similar to a bowl of

**RESPONSE TO OEPA COMMENTS ON THE DRAFT FINAL EVALUATION OF SILO 3 ALTERNATIVES, VOLUMES 1 AND 2, DECEMBER 1996 (cont'd)**

sugar exposed to humidity. Because of this potential clumping, there may be a need for an auger or delumper/crusher. Therefore, these pieces of equipment have been conceptually identified and included in the list of equipment and planning for removal and treatment of residues from Silo 3. The waste retrieval concept is a common element of all alternatives evaluated and would not bias the evaluation for selection of a preferred alternative.

Commenting Organization: Ohio EPA Commentor: OFFO
Section #: 3.2.1.2 Page #: 3-28 Line #: 24 Code: C
Original Comment #: 13
Comment: What is the purpose of cooling the off-gas in the Venturi scrubber and then preheating it again in the off-gas filtration preheater?

Response: The primary purpose of cooling the off-gas in the Venturi scrubber and then preheating it again in the off-gas filtration preheater is to desaturate the off-gas air to prevent condensation from forming in succeeding steps and thus, extend the life of the high efficiency particulate air filters.

Commenting Organization: Ohio EPA Commentor: OFFO
Section #: B.2.3 Page #: B-2-6 Line #: Para 3 Code: C
Original Comment #: 14
Comment: We do not agree that shipment by rail should be deleted from consideration. Provide detailed justification as to why this mode of transport should be deleted. FEMP is in the process of extensive rail work for transporting the waste pit materials, and it would seem that OU4 might be able to utilize these facilities also.

Response: The use of rail has not been deleted from consideration for shipment of treated Silo 3 waste to the NTS or the RPCDF. Appendix B presents a draft of the "Summary of Screening Evaluation of Silo 3 Alternatives." This draft report was based on the assumption that remediation of Silo 3 waste would begin prior to initiation of upgrade of the rail system by Operable Unit 1. Although current information indicates there is neither a health and safety nor a cost advantage for using intermodal shipments to the NTS rather than direct truck shipments to the NTS, as stated on page 3-1 in Volume 1 of the Silo 3 Report, the use of intermodal shipments to the NTS, as well as direct rail shipments to the RPCDF, will continue to be evaluated along with direct truck shipments. The selected mode of transportation will be based on an evaluation of risk, logistics, cost and stakeholder acceptance.

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Commenting Organization: Ohio EPA Commentor: OFFO
Section #: B.5.1.1.3 Page #: B-5-2 Line #: Bullets Code: C
Original Comment #: 15

Comment: One of the "EPA/Stakeholder concerns" is stated as being the ability for a commercial facility to be able to successfully treat the Silo 3 material. There is equal concern for the successful treatment of the Silo 3 material regardless of who does the treatment.

Response: Agreed. To minimize the need for reprocessing any material that does not meet the WAC of the disposal facility, the subcontractor would be required to demonstrate proof-of-process on actual Silo 3 waste before being awarded the remaining portion of the contract for the remediation of the Silo 3 contents. In addition, the selected subcontractor would develop a process control plan and a sampling and analysis plan that would identify the parameters to be monitored to ensure treated materials meet the disposal facility WAC. The RFP also would require the selected subcontractor to reprocess, at the subcontractor's own expense, any treated Silo 3 waste that do not meet the disposal facility WAC.